Transition Metals (TM) and Coordination Compounds and Chemistry

1. Write the valance shell electron configuration of transition metals and transition metal ions.
2. Recall the trend in atomic size and ionization energy of transition metals.
3. Distinguish between a coordination compound and a complex ion (cation or anion).
4. Determine the coordination number oxidation state of the central metal cation of a complex cation or complex anion. Recall the oxidation state pattern when going across a TM row.
5. Provide the chemical name for a complex ion or TM compound.
6. Memorize names and formulas of common monodentate and bidentate (chelating) ligands.
7. Familiarize yourself with the structure and connection bonding sites of polydentate (chelating) ligands.
8. Recall the geometries for coordination numbers 2,4 and 6.
9. Review isomerism (structural and stereoisomers) and their subcategories, coordination, linkage, geometric (cis-trans) and optical (called chiral, two versions: D and L).
10. Sketch possible isomers given formula of a complex ion or coordination compound.
11. Apply the hybridization model for ligand/ion bonding.
12. Review the Crystal Field Theory (CFT) for the octahedral and tetrahedral geometries and recall the d-orbitals' splitting pattern for each geometry type.
13. Determine the photon energy in joules/photon or joules/mol given wavelength of light. Determine the wavelength of absorption given the splitting energy in kJ/mol.
14. List the 6 colors ROYGBV on the color-wheel and know the complementary color relationships and the relationship between absorption and transmission.
15. Recall the relationship between a ligand's d orbital splitting pattern (weak or strong field) and the color absorbed, and the color transmitted.
16. Predict magnetic property of a complex ion (diamagnetic or paramagnetic) and determine if a complex ion is high spin or low spin (depends on ligand type and d-level electron configuration).
17. Recall the important role and structure of biological molecules involving complex ions (the heme complex involving Fe^{2+} or Fe^{3+}) and its porphyrin polydentate ligand. Review the structures and functional reactions involving the hemoglobin or myoglobin with oxygen.
18. Apply the spectrochemical series to the splitting pattern observed (Note: Either the Spectrochemical series or its information for a particular ligand will be provided).